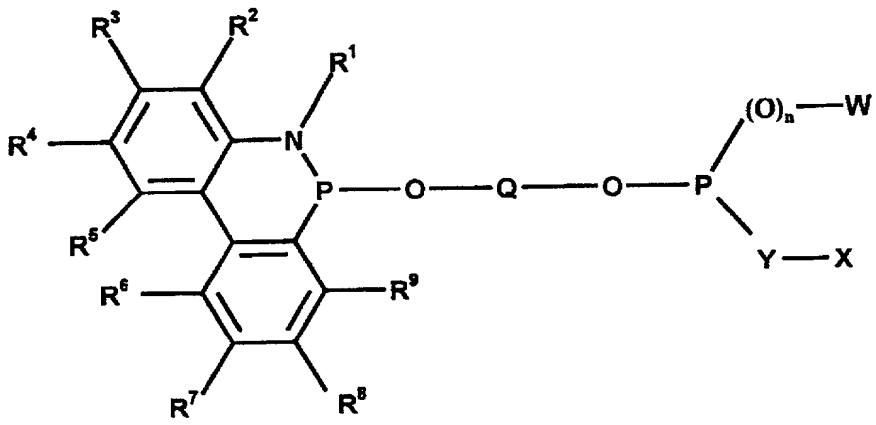
CLAIMS:

1. A phosphinine of the formula I



(I)

where

n = 0 or 1,

Y = O, NH, NR^1,

R^1 = H, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9 = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^2 to R^9 are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{10}$, $-COR^{10}$, $-CO_2R^{10}$, $-CO_2M$, $-SR^{10}$, $-SO_2R^{10}$, $-SOR^{10}$, $-SO_3R^{10}$, $-SO_3M$, $-SO_2NR^{10}R^{11}$, $NR^{10}R^{11}$, $N=CR^{10}R^{11}$, NH_2,

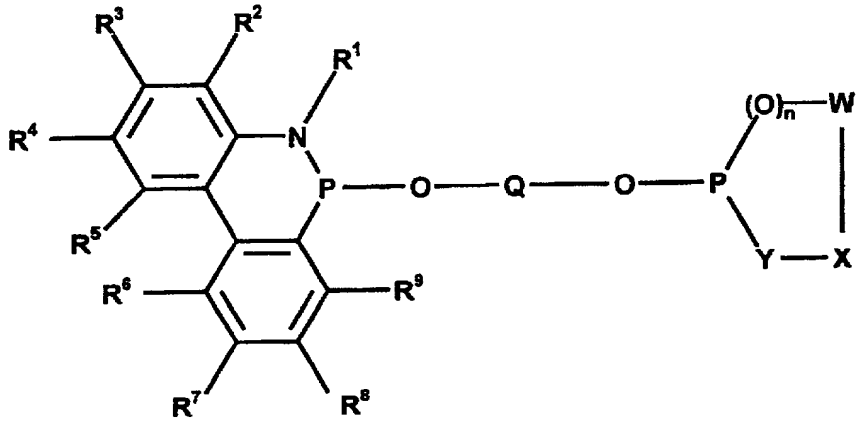
R^{10}, R^{11} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion,

Q = a divalent aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, and

W, X = aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms, which may be identical or different or covalently linked to one another.

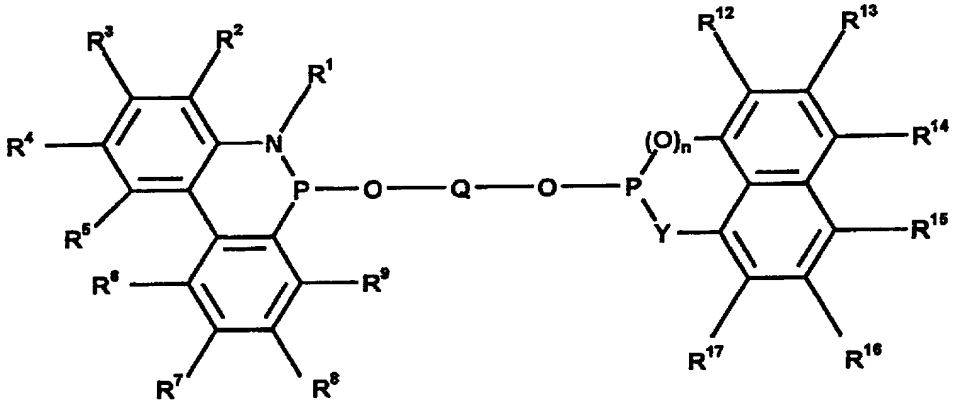
2. The phosphinine as claimed in claim 1, wherein W and X are aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, or aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula II



(II)

and R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, W, X, Y, n and Q are as defined in claim 1.

3. The phosphinine as claimed in claim 1, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula III



(III)

where

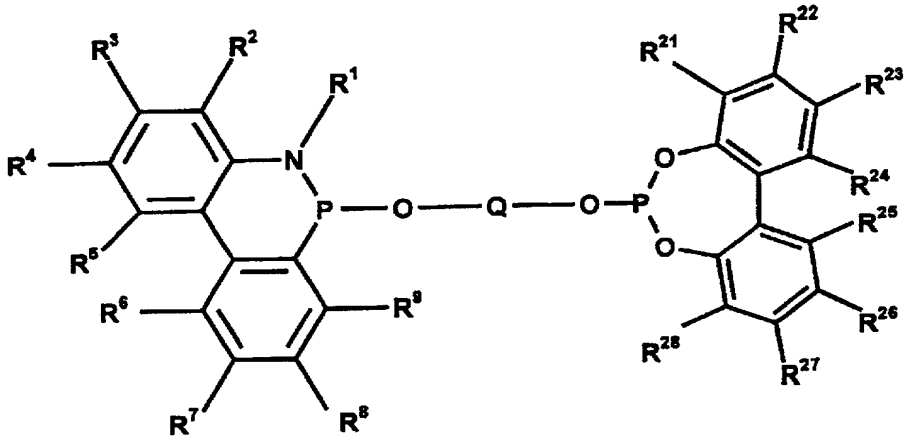
R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50

carbon atoms, where R^{12} to R^{17} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{18}$, $-COR^{18}$, $-CO_2R^{18}$, $-CO_2M$, $-SR^{18}$, $-SO_2R^{18}$, $-SOR^{18}$, $-SO_3R^{18}$, $-SO_3M$, $-SO_2NR^{18}R^{19}$, $NR^{18}R^{19}$, $N=CR^{18}R^{19}$, NH_2,

R^{18}, R^{19} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

4. The phosphinine as claimed in claim 1, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula IV



(IV)

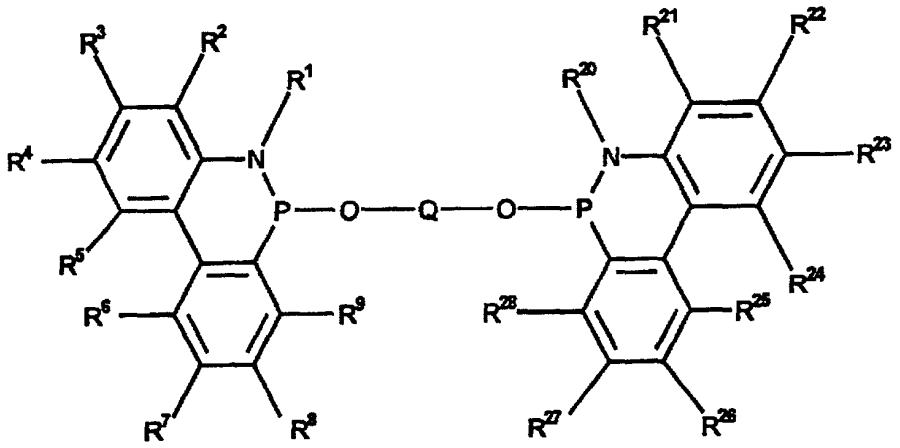
where

R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26}, R^{27}, R^{28} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are each identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N=CR^{29}R^{30}$, NH_2,

R^{29}, R^{30} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

5. The phosphinine as claimed in claim 1, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula V



(V)

where

R^{20} = H, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

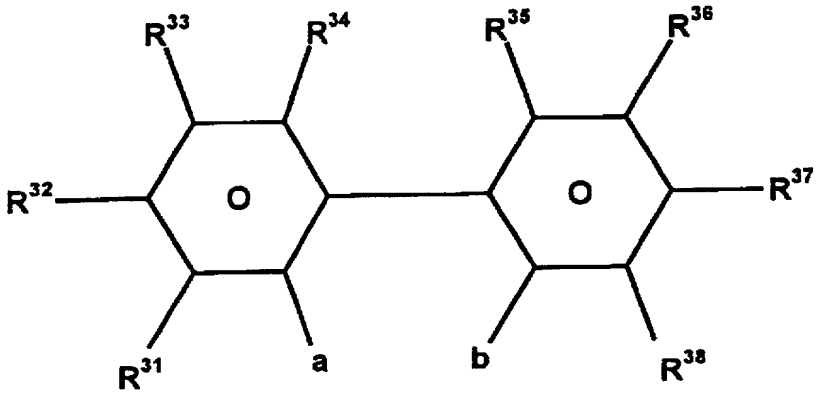
R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26}, R^{27}, R^{28} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N{=}CR^{29}R^{30}$, NH_2,

R^{29}, R^{30} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

where R^2 to R^9 are identical or different and may be covalently linked to one another.

6. The phosphinine as claimed in claim 1, wherein Q is a hydrocarbon radical of the formula VI



(VI)

where

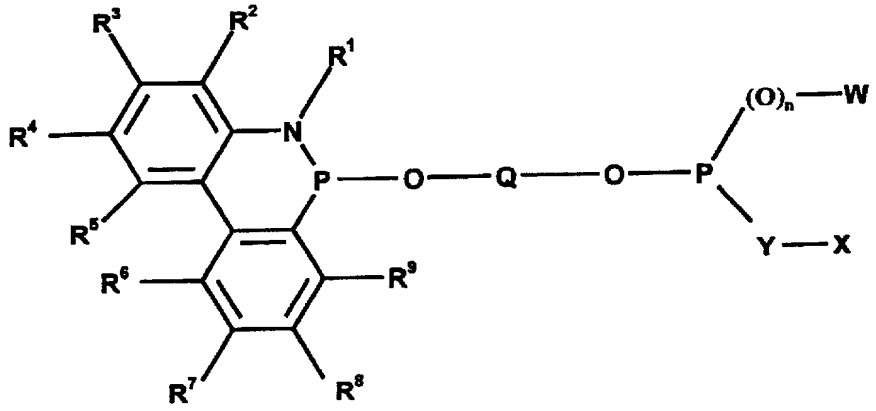
R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, F, Cl, Br, I, $-CF_3$, $-OR^{39}$, $-COR^{39}$, $-CO_2R^{39}$, $-CO_2M$, $-SR^{39}$, $-SO_2R^{39}$, $-SOR^{39}$, $-SO_3R^{39}$, $-SO_3M$, $-SO_2NR^{39}R^{40}$, $NR^{39}R^{40}$, $N{=}CR^{39}R^{40}$, NH_2,

R^{39}, R^{40} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

where the positions a and b serve as linkage points.

7. A phosphinine-metal complex comprising a metal of transition group 4, 5, 6, 7 or 8 of the Periodic Table of the Elements and one or more phosphinines of the formula I

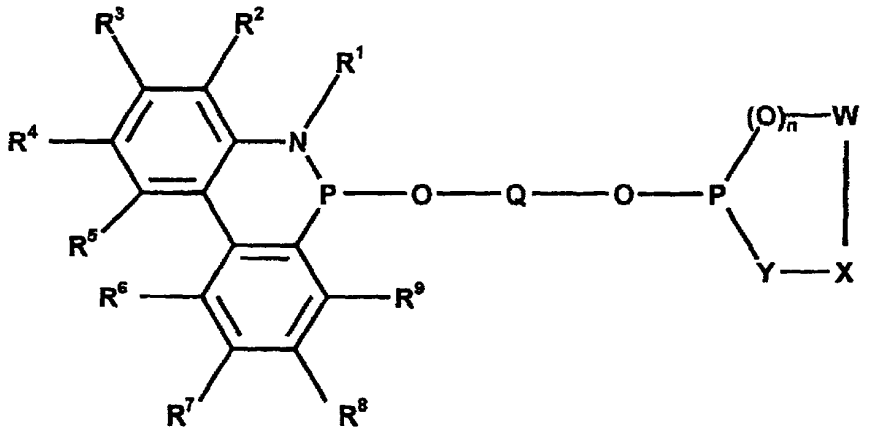


(I)

where

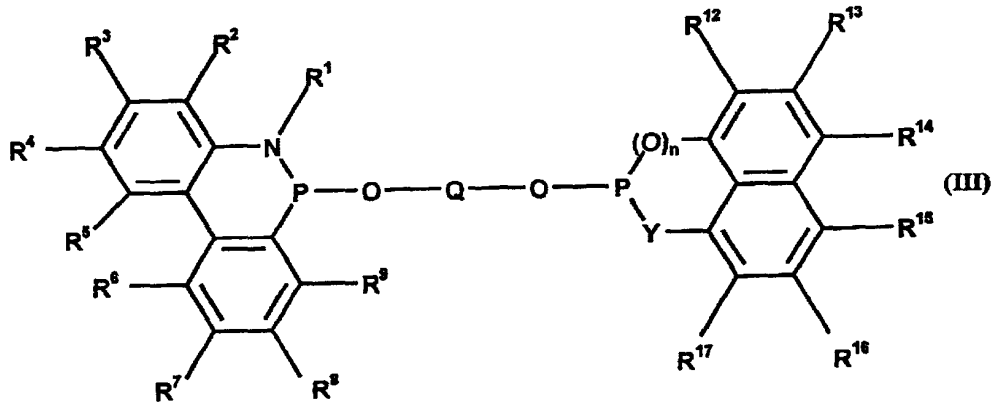
n = 0 or 1,
Y = O, NH, NR^1,
R^1 = H, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,
R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9 = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^2 to R^9 are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{10}$, $-COR^{10}$, $-CO_2R^{10}$, $-CO_2M$, $-SR^{10}$, $-SO_2R^{10}$, $-SOR^{10}$, $-SO_3R^{10}$, $-SO_3M$, $-SO_2NR^{10}R^{11}$, $NR^{10}R^{11}$, $N=CR^{10}R^{11}$, NH_2,
R^{10}, R^{11} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different,
M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion,
Q = a divalent aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms,
W, X = aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms, which may be identical or different or covalently linked to one another.

8. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aliphatic-aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula II.



(II)

9. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula III



(III)

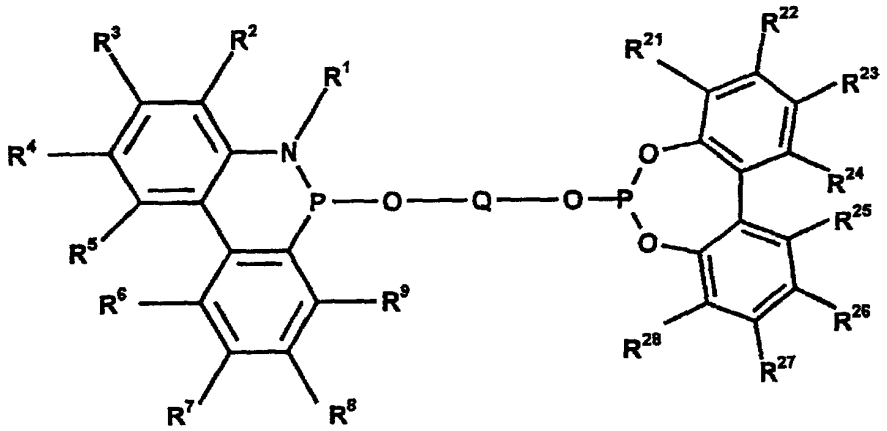
where

R^{12}, R^{13}, R^{14}, R^{15}, R^{16}, R^{17} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{12} to R^{17} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{18}$, $-COR^{18}$, $-CO_2R^{18}$, $-CO_2M$, $-SR^{18}$, $-SO_2R^{18}$, $-SOR^{18}$, $-SO_3R^{18}$, $-SO_3M$, $-SO_2NR^{18}R^{19}$, $NR^{18}R^{19}$, $N{=}CR^{18}R^{19}$, NH_2,

R^{18}, R^{19} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, identical or different, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

10. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula IV



(IV)

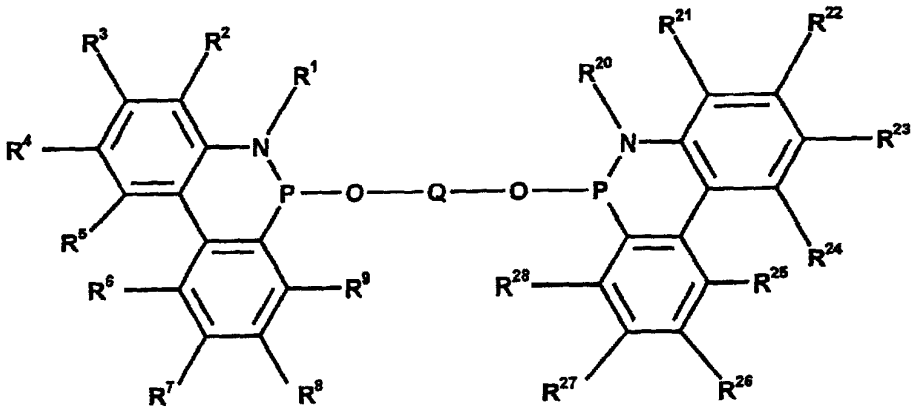
where

R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26}, R^{27}, R^{28} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N{=}CR^{29}R^{30}$, NH_2,

R^{29}, R^{30} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms, and

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion.

11. The phosphinine-metal complex as claimed in claim 7, wherein W and X are aromatic hydrocarbon radicals having from 1 to 50 carbon atoms and are covalently linked as in formula V



(V)

where

R^{20} = H, an aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

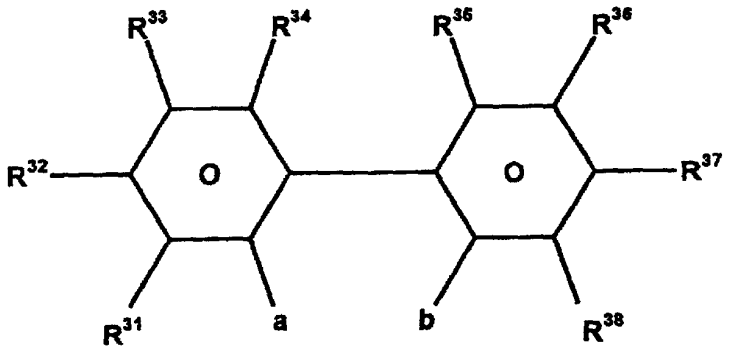
R^{21}, R^{22}, R^{23}, R^{24}, R^{25}, R^{26}, R^{27}, R^{28} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, where R^{21} to R^{28} are identical or different and may be covalently linked to one another, F, Cl, Br, I, $-CF_3$, $-OR^{29}$, $-COR^{29}$, $-CO_2R^{29}$, $-CO_2M$, $-SR^{29}$, $-SO_2R^{29}$, $-SOR^{29}$, $-SO_3R^{29}$, $-SO_3M$, $-SO_2NR^{29}R^{30}$, $NR^{29}R^{30}$, $N{=}CR^{29}R^{30}$, NH_2,

R^{29}, R^{30} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

R2 to R9 are identical or different and may be covalently linked to one another.

12. The phosphinine-metal complex as claimed in claim 7, wherein Q is a hydrocarbon radical of the formula VI



(VI)

where

R^{31}, R^{32}, R^{33}, R^{34}, R^{35}, R^{36}, R^{37}, R^{38} = H, an aliphatic, alicyclic, aliphatic-alicyclic, heterocyclic, aliphatic-heterocyclic, aromatic, aromatic-aromatic, aliphatic-aromatic hydrocarbon radical having from 1 to 50 carbon atoms, F, Cl, Br, I, $-CF_3$, $-OR^{39}$, $-COR^{39}$, $-CO_2R^{39}$, $-CO_2M$, $-SR^{39}$, $-SO_2R^{39}$, $-SOR^{39}$, $-SO_3R^{39}$, $-SO_3M$, $-SO_2NR^{39}R^{40}$, $NR^{39}R^{40}$, $N{=}CR^{39}R^{40}$, NH_2,

R^{39}, R^{40} = H, a substituted or unsubstituted, aliphatic or aromatic hydrocarbon radical having from 1 to 25 carbon atoms,

M = an alkali metal, alkaline earth metal, ammonium or phosphonium ion, and

where the positions a and b serve as linkage points.

13. The phosphinine-metal complex as claimed in claim 7, wherein the metal is rhodium, platinum, cobalt or ruthenium.

14. A process comprising hydroformylating an olefin wherein the phosphinine claimed in claim 1 is present in the olefin.

15. A process comprising hydroformylating an olefin wherein the phosphinine-metal complex claimed in claim 7 is used as a catalyst.

16. A process comprising hydroformylating an olefin wherein the phosphinine claimed in claim 1 and at least one other phosphorus containing ligand is present in the olefin.

17. A process comprising hydroformylating an olefin wherein the phosphinine-metal complex claimed in claim 7 is used as a catalyst in the presence of at least one other phosphorus containing ligand.